N. Dubois

NORTHEASTERN FOREST EXPERIMENT STATION
Forest Insect and Disease Laboratory
135 Wood Street, West Haven, Connecticut

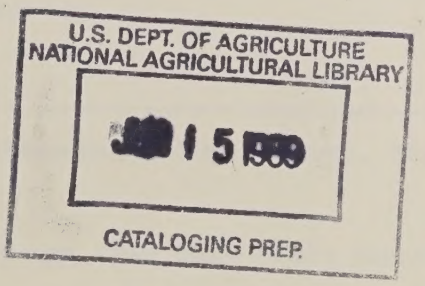
4500-FS-NE-2202.10

To: All cooperators and interested parties

Enclosed is the final report of the 1965 Bt pilot test against the gypsy moth conducted in Connecticut and New York. The report contains the essential information concerning the test.

Much of the data is being subjected to automatic data processing and an additional report will be prepared when this analysis is finished.

Franklin B. Lewis
Project Leader



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# 1965 Bt PILOT TEST AGAINST THE GYPSY MOTH IN CONNECTICUT AND NEW YORK

by

F. B. Lewis[1/] and D. P. Connola[2/]

In the spring of 1965, two cooperative pilot tests of a new Bt preparation were planned and conducted against the gypsy moth. One test was carried out in southcentral Connecticut by personnel of the Forestry Division, Connecticut State Park and Forest Commission and the Northeastern Forest Experiment Station. The other was conducted in Saratoga County, New York, by personnel of the New York Conservation Department, the New York Museum and Science Service, and the Northeastern Forest Experiment Station.

The primary objective of these two pilot tests was to determine if the new, improved Thuricide emulsifiable concentrate[3/] applied by helicopter would control the gypsy moth satisfactorily under a variety of field conditions.

## METHODS AND PROCEDURES

The dosages, rates and methods of application, evaluation procedures, and control standards were the same for both pilot tests. The insect densities and previous population histories were very similar in both Connecticut and New York.

The essential differences between the two experimental areas were topographical features, tree species, forest composition, and stand heights and densities. These differences will be discussed in a relevant way in the Results and Conclusions section.

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1/Insect Pathologist, Northeastern Forest Expt. Sta., U. S. D. A., Forest Service.

2/Senior Scientist Entomology, New York State Museum and Science Service, Albany, N.Y.

3/Thuricide 90TS Flowable, product of Biofarm Div., International Minerals and Chemical Corp., Wasco, Calif.

# 1963 BC PILOT TEST AGAINST THE GYPSY MOTH IN CONNECTICUT AND NEW YORK

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[1] Insect Pathologist, Northeastern Forest Expt. Sta., U. S. D. A., Forest Service.

[2] Senior Scientist Entomology, New York State Museum and Science Service, Albany, N.Y.

[3] Thuricide 90TS Flowable, product of Biofarm Div., International Minerals and Chemical Corp., Waco, Calif.

## Pre-Test Laboratory Evaluations

Biological evaluation.--A series of dilutions of the Bt concentrate to be used in these pilot tests were tested for biological activity against young gypsy moth larvae. The dilutions bracketed the proposed field dosages and all showed effective activity against the gypsy moth.

Spore viability determinations and crystal concentrations.--All containers of the Bt emulsifiable concentrate were sampled for viable spore count and crystal concentration. These counts were used to calculate the theoretical concentration of spores and crystals in the spray mixes to be used in the tests.

Aliquots of the finished spray formulations were examined for spore and crystal concentration and compared with the theoretical concentrations. These comparisons showed that the formulations actually mixed and applied were of the desired concentrations.

Chemical contamination.--The spray formulations and the water used to dilute the Bt concentrate were examined for chemical pesticides by electron-capture gas chromatography at the New York State Food Laboratory[4/]. No contaminants were found.

The pH and $Fe^{++}$ content of the water were also checked and found to be acceptable.

## Experimental Areas

Connecticut.-- Eight woodlots were selected in the Cockaponset State Forest in the Guilford-Killingworth area of Connecticut. These plots ranged from 200 to 350 acres in size and were blocked out of larger generally infested areas of the State Forest. The initial insect populations ranged from 500 to 10,000 egg masses per acre. The test plots were composed mostly of mature oaks, principally (70 - 100') red, white, and chestnut oak.

New York.--Six woodlots were selected in the Charleton-Ballston Lake area, Saratoga County, New York. The plots ranged from 90 to 250 acres in size. These plots were woodlots in themselves, not blocked out of larger areas, and were surrounded by pasture land.

The initial insect populations ranged from 1,000 to 10,000 egg masses per acre. The test plots were, with the exception of plot 5, flat and composed principally of low (30' - 50') gray birch and poplar. Plot 5 was flat, but composed of tall (80' - 100') mature red and chestnut oaks.

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4/Reported in a letter from Dr. Elmer George, Jr., Director, New York State Food Laboratory to Dr. D. L. Collins, New York State Entomologist.

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[1] Reported in a letter from Dr. Elmer George, Jr., Director, New York State Food Laboratory to Dr. D. L. Collins, New York State Entomologist.

## Treatments

Formulations.--The insecticidal material used was Thuricide 90TS Flowable. Only water formulations were used with no sticker added.

Dosages.--Two dosages were used in both pilot tests as follows:

1. 1 pint of 90TS in water to make 2 U.S. gallons

2. 2 pints of 90TS in water to make 2 U.S. gallons

Rate of application.--All sprays were applied at the rate of two gallons per acre.

Time of application.--The treatments in both tests were scheduled to be applied when leaf expansion was nearly full. The larvae in all plots were 2nd and 3rd instar when treatment was made.

Tables 1 and 2 give the pertinent plot data for the two pilot tests.

Replications.--Each of the two treatments were replicated three times in the Connecticut test. Two replicates of each treatment were used in the New York test. There were two check areas for each test.

Aircraft.--A Bell 47G4 helicopter was used in the New York test. Boom pressure was 60 pounds, and the 50' boom was equipped with 86 nozzles (D-4, D-5, and D-6).

A Bell 47G2A1 helicopter was used in the Connecticut test. Boom length on this aircraft was 30'. Nozzles were S.S. 1040.

Both planes were calibrated to apply 2 gallons of spray per acre with medium atomization (ca. 150 microns m.m.d.).

Communications.--Helispot and field crews were equipped with portable short wave radios 3/. No applications were made unless approval was received from the field crew on the plot.

## Helispot Operations

Two helispots were used in the New York pilot test. Mixing was done in a new 275 gallon tank using a circulating pump. The sprays for plots 1, 2, and 3 were mixed and applied from Helispot #1. The spray mix for plot 5 was formulated at Helispot #1 and transported to Helispot #2 in a clean 500 gallon tank truck provided by the applicator. Both helispots were within two miles of the plots to be sprayed.

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3/Motorola Handi-Talkie FM Radiophone. U. S. Forest Service airnet frequency.

Table 1.--Plot Data - Connecticut Rt Test - 1965

| Plot | Date treated | Acres | Dominant tree species | Dose applied | Gallons of spray applied 1/ | Number of flights |
|---|---|---|---|---|---|---|
| 1 | May 23 | 211 | Red and chestnut oak | 2 pints | 464 | 8 |
| 2 | May 24 | 318 | Red oak | 1 pint | 700 | 13 |
| 3 | May 20<br>May 21 | 204 | Red, white chestnut oak | 1 pint | 449 | 8 |
| 4 | May 25 | 342 | Chestnut and white oak | 1 pint | 752 | 14 |
| 5 (Check) | - | - | Red oak | - | - | - |
| 6 | May 24 | 210 | Red, white and chestnut oak | 2 pints | 462 | 8 |
| 7 | May 25 | 238 | Red and white oak | 2 pints | 504 | 9 |
| 8 (Check) | - | - | Red, white, and chestnut oak | - | - | - |
| TOTAL | | 1523 | | | 3331 | 60 |

1/ With 10% overage

Table 3.--Plot Data - New York St Test - 1963

| Plot | Date | Acres | Dominant tree species | Dose applied | Gallons of spray applied 1/ | Number of flights | Total treatment time |
|---|---|---|---|---|---|---|---|
| 1 | May 25 | 115 | Poplar | 1 quart | 245 | 5 | 31 minutes |
| 2 | " | 90 | Poplar, gray birch | 1 quart | 200 | 4 | 25 minutes |
| 3 | " | 230 | Poplar, gray birch | 1 pint | 495 | 10 | 62 minutes |
| 4 (check) | - | - | Poplar, gray birch, oak | - | - | - | - |
| 5 | May 25 | 200 | Oak | 1 pint | 420 | 7 | 38 minutes |
| 6 (check) | - | - | Poplar, gray birch, oak | - | - | - | - |
| TOTAL | | 635 | | | 1360 | 26 | 2 hours 34 minutes |

1/ plus 10% overage

Four helispots were used in the Connecticut pilot test. All mixing was done in a new 500 and a new 275 gallon tank at the Chester Airport. Mixes were transported to the other three helispots by a clean 500 gallon tank truck provided by the Connecticut Park and Forest Commission.

Field Test Evaluations

Field evaluation procedures were similar to those reported in 1963[6/].

Sampling layout.--Five 0.1 acre subplots were established in all treated and check plots. Spray deposit, spray drift, and treatment effects were assessed in these subplots.

Spray deposit and drift.--Two open Trypticase agar-filled petri dishes were placed on 2-foot stands beneath an opening in the canopy in each subplot immediately before spray application. The covers of the dishes were replaced 10 - 15 minutes after spraying was completed. Dishes were also placed in check plots near the plot under treatment. When plot spraying required more than one day to complete, additional sets of dishes were placed in the subplots, and the deposits on the additional sets were added to the originals for the total deposit for each subplot.

Ten-minute larvae counts.--These counts were made while walking slowly along the string line connecting the five subplots; thus there was a plot reading for these counts, not a subplot measurement. The 10-minute counts were initiated when the larvae were in the 3rd and 4th instar. Counts were made twice weekly until pupation occurred.

Frass collection.--Three 3' x 6' cloth trays were set up in each subplot before treatment was initiated. These trays were supported by wooden stakes approximately 1' above the forest floor. Collections were made twice weekly. The frass from the three trays was pooled, dried, and weighed. The frass was recorded as the amount per day per hammock (tray).

Dead larvae collections and examinations.-- Dead larvae were collected from the three trays in each subplot twice weekly. These were examined microscopically and cause of death recorded (Bt, virus, combination, or no apparent cause).

Defoliation.--Defoliation estimates were made in each subplot just before spraying was initiated. Estimates were made again at the conclusion of larval feeding. The net change in defoliation was recorded. Estimates were made on susceptible tree species only

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6/Lewis, F. B. et al. Pilot test of a Bacillus thuringiensis liquid concentrate applied by aircraft for control of the gypsy moth - New York 1963. Special Rpt. (processed) Forest Insect and Disease Lab., Northeast. Forest Expt. Sta. 14 pp + appendix. 1963.

Four heliports were used in the Connecticut alert test. All mixing was done in a new 500 and a new 275 gallon tank at the Groston Airport. Mixes were transported to the other three heliports by a clean 500 gallon tank truck provided by the Connecticut Park and Forest Commission.

Field Test Evaluations

Field evaluation procedures were similar to those reported in 1959.

Sampling Jay.--Five 0.1 acre subplots were established in all treated and check plots. Spray deposit, spray drift, and treatment effects were assessed in these subplots.

Spray deposit and drift.--Two open Petripetose aper-filled petri dishes were placed on 2-foot stands beneath an opening in the canopy in each subplot immediately before spray application. The covers of the dishes were replaced 15 minutes after spraying was completed. Dishes were also placed in check plots near the plot under treatment. When plot spraying required more than one day to complete, additional sets of dishes were placed in the subplots, and the deposits on the additional sets were added to the originals for the total deposit for each subplot.

Ten-minute leaves counts.--Three counts were made while walking slowly along the aisles connecting the five subplots; thus there was a plot reading for these counts, not a subplot measurement. Two 10-minute counts were initiated when the leaves were in the bud and bud stage. Counts were made twice weekly until pupation occurred.

Trees collection.--Three 3' x 6' cloth trays were set up in each subplot before treatment was initiated. These trays were supported by wooden stakes approximately 1' above the forest floor. Collections were made twice weekly. The frass from these trays was pooled, dried, and weighed. The frass was recorded as the amount per day per hammock (trap).

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Egg mass counts.--As in previous tests, the primary criterion of control effect was the residual number of post-spray egg masses in the subplots. Percentage change in egg masses between pre-spray and post-spray counts was also taken as a measure of control effect.

An arbitrary number (50 egg masses per acre or less) was set as an acceptable level of control.

Pre-spray egg mass counts were made in each subplot before hatch occurred in the spring.

A preliminary egg mass count was made in all subplots immediately after oviposition was completed.

The final egg mass counts were made after leaf fall occurred in the fall.

Average numbers of eggs per mass in the pre-spray and post-spray final counts were calculated in the Connecticut pilot test and estimated in the New York test.

## RESULTS

### Spray Deposit and Drift.

The data derived from the petri dishes placed in the plots during spray operations were used only to determine whether deposit occurred in the sampling subplots and if significant deposit occurred in the check plots.

In the Connecticut test, drift did occur in one check plot (Conn. #5). No drift occurred in the New York test or the second Connecticut check plot.

Of some interest is the gross difference between the deposit in the two pilot tests. Approximately twice as much deposit was recorded in New York as Connecticut (See Tables 3 and 4). These differences in deposit undoubtedly reflect the differences in stand densities and structure between the New York and Connecticut plots.

### Treatment Effects

As in previous tests, the correlations between the primary criterion (residual number of egg masses) and the 10-minute count and the frass weight were significant. Tables 3 and 4 give the data for the 10-minute counts and the frass weights. The correlations between these two interim measurements and residual number of egg masses is stronger than the correlation with percent change in egg mass number.

Table 5.--Data summary - Connecticut Bt pilot test - 1965

| Plot | Dose applied 1/ | Plate deposit (colonies) | Average 10-minute count (larvae) | Frass weight (gm) | Defoliation change (percent) | Mortality 2/ cause percent Bt | Mortality 2/ cause percent Virus | Egg masses per acre Pre-spray | Egg masses per acre Residual | Egg masses per acre Percent reductio |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 299 | 396.6 | 7.34 | 86.6 | 31.7 | 32.3 | 7664 | 678 | 91 |
| 2 | 1 | - | 86 | 1.58 | 40 | 18.6 | 18.6 | 220 | 92 | 58 |
| 3 | 1 | 120.0 | 210 | 5.34 | 85.6 | 8.7 | 36.9 | 6212 | 1855 | 70 |
| 4 | 1 | 164.8 | 85 | 4.02 | 99 | 29.5 | 28.5 | 4710 | 1568 | 67 |
| 5 | 0 | 39.9 3/ | 111 | 4.90 | 72 | 12.8 | 20.5 | 568 | 1198 | 105 incr. |
| 6 | 2 | 323.5 | 108 | 5.34 | 63 | 54.1 | 9.5 | 1202 | 2250 | 83 incr. |
| 7 | 2 | 330.7 | 171 | 5.98 | 61.8 | 31.3 | 16.4 | 804 | 746 | 7 |
| 8 | 0 | 0 | 476 | 5.72 | 80 | 3(?) | 50.9 | 4096 | 1492 | 63 |
| High 4/ Dose | 2 | 317.7 | 225.2 | 5.55 | 70.5 | 39.0 | 19.4 | | 1225 | 62.2 |
| Low 5/ Dose | 1 | 250.8 | 127 | 5.65 | 61.5 | 18.9 | 29.0 | | 1172 | 69.0 |
| Checks | 0 | 19.9 | 295 | 5.51 | 76 | 7(?) | 35.7 | | 1545 | 45 |

1/ pints of Thuricide 90TS in 2 gallons of aqueous spray

2/ death of larvae in hammocks due to Bt and virus, unlisted remainder due to other causes

3/ drift from #3 and #4

4/ average EM/acre = 3223 prior to spray

5/ average EM/acre = 3714 prior to spray

Table 4.--Data summary - New York Bt pilot test - 1965

| Plot | Dose applied 1/ | Plate deposit (colonies) | Average 10-minute count (larvae) | Frass weight (gm) | Defoliation change (percent) | Mortality 2/ cause percent Bt | Mortality 2/ cause percent Virus | Egg masses per acre Pre-spray | Egg masses per acre Residual | Egg masses per acre Percent reduction |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 789.2 | 45 | 0.26 | 12.1 | 26.1 | 39.1 | 3710 | 110 | 96.9 |
| 3 | 2 | 752.8 | 42 | 0.24 | 25.2 | 19.9 | 49.6 | 2606 | 132 | 94.9 |
| 5 | 1 | 746.4 | 103 | 1.66 | 47.0 | 32.2 | 26.0 | 3154 | 118 | 96.3 |
| 4 | 0 | 0 | 116 | 1.62 | 42.0 | 0 | 61.8 | 2630 | 446 | 83.1 |
| 2 | 1 | 210.8 | 48 | 0.64 | 24.8 | 37.5 | 28.7 | 2314 | 401 | 82.9 |
| 6 | 0 | 0 | 154 | 2.65 | 53.2 | 0 | 68.4 | 6440 | 418 | 92.5 |
| High Dose | 2 | 761.0 | 43.5 | 0.25 | 18.6 | 23 | 44.3 | | 121 | 95.9 |
| Low Dose | 1 | 478.6 | 78.0 | 1.15 | 35.9 | 34.8 | 27.8 | | 259 | 90 |
| Checks | 0 | 0 | 136.0 | 2.13 | 47.6 | 0 | 65.1 | | 432 | 89.5 |

1/ pints of Thuricide 90TS in 2 gallons of aqueous spray

2/ death of larvae in hammocks due to Bt and virus, unlisted remainder due to other causes.

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| Chapter D

Causes of mortality of collected dead larvae.--Natural virus was quite prevalent in the populations in both pilot tests. This is undoubtedly related to the initial high densities of these populations. Observed mortality due to Bt never exceeded 55 percent. Of interest is the fact that virus mortality appears to be inversely related to the Bt mortality.

One unusual feature of the observed mortality in the two tests was that the higher dosage used in New York produced less Bt-caused mortality than the lower dosage. The reverse condition was observed in Connecticut.

Defoliation.--Net defoliation was reduced in the treated plots in both pilot tests. The reduction was much more pronounced in New York than in Connecticut, again reflecting the differences in deposit due to stand densities and structures and resultant effectiveness.

Egg mass counts.--According to the standard of effective control which was specified, neither pilot test achieved acceptable control since the residual egg mass count in treated plot reached 50 or less. From these results it must be concluded that the material failed to give acceptable control of the gypsy moth under the field conditions met.

Percentage reductions in egg mass numbers, particularly in New York, averaged 96 percent for the high dosage and 90 percent for the lower dosage, whereas 62 percent was achieved at the high dosage in Connecticut and 69 percent with the lower dosage. Degree of reduction in the treated plots over natural reduction in the untreated plots was greater in Connecticut than in New York. Tables 3 and 4 give the percentage reduction and residual number of egg masses for both tests.

## SUMMARY AND CONCLUSION

Although the final results of these pilot tests were not as good as expected, it is of great interest and importance to examine the possible factors that contributed to them.

No problems were encountered in mixing or applying the spray. Suspendability and sprayability of the mixes were excellent.

Weather conditions at the time of spraying varied, but in all cases they were acceptable for experimental spraying.

Both helicopters and pilots performed excellently and left nothing to be desired in the opinion of the field observers.

Thus, the conditions for spraying, the actual spraying operations, and the spray formulations were all satisfactory and did not contribute in any essential degree to the lack of success of the pilot tests nor to the obvious difference in the results in the two areas.

The experimental material used in these tests showed high potency in laboratory tests, and they gave a similar degree of control as previously tested emulsifiable Bt concentrates. The extended activity of this new material added 1 - 2 days more in overall effectiveness, but essentially the insecticidal activity was not noticeably different from previously used non-extended concentrates. In brief, the field effectiveness and laboratory

Causes of mortality of collected dead larvae.--Natural virus was quite prevalent in the populat[illegible] in both tests. This DA undoubtedly related to the initial high densities of these populations. Observed mortality due to BT never exceeded 55 percent. Of interest is the fact that virus mortality appears to be inversely related to the BT mortality.

One unusual feature of the observed mortality in the two tests was that the higher dosage used in New York produced less BT-caused mortality than the lower dosage. The reverse condition was observed in Connecticut.

Defoliation.--Net defoliation was reduced in the treated plots in both pilot tests. The reduction was much more pronounced in New York than in Connecticut, again reflecting the difference in deposit due to stand densities and structures and resultant effectiveness.

[illegible] cases counts.--According to the standard of effective control which was specified [illegible] ther pilot test achieved acceptable control since the residual egg mass count in treated plot reached 50 or less. From these results it must be concluded that the material failed to give adequate control of the gypsy moth under the tidal conditions met.

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## ACKNOWLEDGEMENTS

The authors wish to thank the following organizations and personnel for their contributions to this test:

In Connecticut: The Connecticut Park and Forest Commission, Forestry Division, particularly Mr. H. A. McKusick, State Forester, and Mr. F. Emigh, Forest Ranger, for providing experimental areas, personnel and equipment; the Connecticut Water Company for providing metering equipment and certain spray areas.

In New York: The New York State Conservation Department, particularly Mr. C. J. Pope, Superintendent, J. J. Homiak and R. C. Sweet, Senior Foreman, for providing experimental areas, equipment, and personnel for the New York test.

Thanks are also due Mr. W. Merrill, Regional Air Officer, for obtaining FAA clearance and for flying the Connecticut area for aerial photography.

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Thanks are also due Mr. W. Terrill, Regional Air Officer, for obtaining FAA clearance and for flying the Connecticut area for aerial photography.

activity of the new extended activity material was as good or better than previously used materials.

It is obvious, then, that we must turn our attention to the physical differences between the New York and Connecticut areas to attempt to discover why the results differed so markedly.

The major factors to keep in mind are: (1), the deposit in the lower canopy in New York was approximately twice that in Connecticut; (2), the treated plots in New York were composed of low, scattered birch and poplar, in contrast to the tall, closed-crown oak plots in Connecticut; (3), the terrain in New York was flat as contrasted to the hilly terrain in Connecticut; and (4), each treated plot in New York was an entire infested woodlot, whereas in Connecticut the treated plots were blocked out of larger untreated infested areas.

It appears that the main reason for the marked difference between the results in New York and the results in Connecticut is the differences in the experimental areas themselves.

Apparently sufficient insecticidal material did not reach the feeding insects in the Connecticut plots due to the structure of the stands, the constraints on the pilot due to terrain, the screening effect of high closed canopies, and the feeding behavior of the gypsy moth larvae in the 2nd - 3rd instar.

The major conclusion from these pilot tests is that the material used can achieve acceptable results only if it is applied in sufficient volume and retained on the treated foliage long enough in an active form for all of the insects to ingest a lethal dose.

## RECOMMENDATIONS

From the results of these tests it is recommended that available Bt products be tested again in one or both of the following ways:

(1) Similar concentrations as the high dosage used in these tests be applied in greater gallonage to ensure full coverage of the entire canopy.

(2) Similar concentrations as the high dosage used in this test be applied twice, at the same gallonage, separated by approximately 10 days.

(3) With and without additives to reduce evaporation and improve sticking qualities.

# APPENDIX

Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot 1 Township Saratoga County, N.Y. Acres 115

Date Sprayed May 25, 1965 Dose 2 pts. Bt 90 TS

Spray Concentrate (Actual) $3.57 \times 10^9$ crys/ml. $4.25 \times 10^9$ sp/ml Spray Concentrate(Specif.) $4.85 \times 10^9$ sp/ml $4.96 \times 10^9$ crys/ml

sp/crys = 1.19:1

| Item | SUBPLOTS 1 | 2 | 3 | 4 | 5 | Average |
|---|---|---|---|---|---|---|
| Deposit, Petri dishes | 134 | 571 | 735.5 | 1160.5 | 1337 | 789.2 |
| Egg mass/acre - spring | 2840 | 4150 | 3100 | 4160 | 4300 | 3710 |
| Egg mass/acre - preliminary | 240 | 0 | 0 | 120 | 40 | 80 |
| Egg mass/acre - fall | 240 | 190 | 30 | 80 | 50 | 120 |
| Eggs/mass - spring | | | | | | |
| Eggs/mass - fall | small | small | small | small | small | |
| Mean Erase/day/hammock | 0.25 | 0.16 | 0.11 | 0.57 | 0.19 | 0.26 |
| % reduction - Egg mass/acre | | | | | | |
| Defoliation, pre spray % | 5 | 5 | 5 | 5 | 2 | 4.4 |
| Spec. only Defoliation, post spray % | 30 | 15 | 15 | 10 | 15 | 16.5 |
| 10-minute larval count | | | | | Average | 45 |
| | | | | | High | 118 |

Plot Data Form - 90TS 1965 Gypsy Moth - N.Y. and Conn.

Plot 2 Township Saratoga County, N.Y. Acres 90

Date Sprayed May 25, 1965 Done 2 pts. 90TS

Spray Concentrate(Actual) $5.30 \times 10^9$ cry/ml $5.25 \times 10^9$ sp/ml Spray Contrate (Specif.) $5.37 \times 10^9$ sp/ml $5.39 \times 10^9$ cry/ml

sp/cryo ratio = 0.96:1

| Item | SUBPLOTS | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Deposit, Petri dishes | 971 | 705.5 | 420 | 573.5 | 796 | 732.8 |
| Egg mass/acre - spring | 2620 | 1050 | 1320 | 3300 | 4640 | 2606 |
| Factor | | | | | | |
| Egg mass/acre preliminary | 150 | 150 | 100 | 350 | 150 | 180 |
| Egg mass/acre - fall | 90 | 120 | 160 | 240 | 50 | 132 |
| Egg/mass - spring | | | | | | |
| Egg/mass - fall | medium | medium | medium | small | small | |
| Gypsy frass/day/hammock | 0.11 | 0.24 | 0.44 | 0.15 | 0.26 | 0.24 |
| % reduction Egg mass/acre | | | | | | |
| Defoliation, pre-spray % | 12 | 10 | 7 | 10 | 25 | 12.8 |
| Est. only Defoliation post-spray % | 40 | 35 | 25 | 45 | 45 | 38.0 |
| 10-minute larval count | | | | | Average | 43 |
| | | | | | High | 109 |

Plot Data Corn - 2015 1965 Crop Acts - N.Y. and Corn.

Township Saratoga County, N.Y. Acres 53

Date Sprayed May 25, 1965 Date 2 pts. 2015

Spray Contents (Actual) $5.36 \times 10^9$ sq/mi Spray Contents (Specific) $5.37 \times 10^9$ sq/mi

Average ratio = 0.9951

| Item | Values | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Yield, Total fibres | 991 | 1012 | 1134 | 1213 | 1178 |
| Grass, acre - spring | 2180 | 1420 | 1120 | 1300 | |
| Grass/acre preliminary | 140 | 210 | 110 | 120 | 140 |
| Grass/acre - fall | 180 | 170 | 140 | 210 | 170 |
| Grass - spring | | | | | |
| Grass - fall | medium | medium | medium | small | small |
| Grass/day/Hectare | 0.31 | 1.24 | 0.14 | 0.12 | |
| Function of grass/acre | | | | | |
| Elevation, pre-spray % | 12 | 19 | 7 | 14 | 17 |
| Only Elevation post-spray % | 49 | 32 | 22 | 41 | 12 |
| | | | | | |
| | | | | | |

Plot Data Form - 90TS 1965 Gypsy Moth - N.Y. and Conn.

Plot 3 Township Saratoga County, N.Y. Acres 230

Date Sprayed May 25, 1965 Dose 1 pt. of 90TS

Spray Concentrate(Actual) $3.5 \times 10^9$ cry/ml $3.5 \times 10^9$ sp/ml Spray Concentrate(Specif.) $2.06 \times 10^9$ sp/ml

| Item | SUBPLOTS 1 | 2 | 3 | 4 | 5 | Average |
|---|---|---|---|---|---|---|
| Deposit, Petri dishes | 166 | 657.5 | 1103.5 | 1214.2 | 590.5 | 746.4 |
| Egg mass/acre - spring | 2400 | 5600 | 5120 | 4850 | 1720 | 3134 |
| Egg mass/acre preliminary | 240 | 80 | 960 | 840 | 400 | 504 |
| Egg mass/acre - fall | 90 | 120 | 30 | 150 | 200 | 118 |
| Eggs/mass - spring | | | | | | |
| Eggs/mass - fall | small | medium | medium | small | small | |
| Grass fraass/day/hammock | 0.09 | 1.80 | 1.94 | 2.58 | 1.11 | 1.66 |
| % reduction Egg mass/acre | | | | | | |
| Defoliation, pre-spray % | 20 | 20 | 5 | 10 | 10 | 13 |
| Sumt. only Defoliation, post-spray % | 50 | 25 | 85 | 95 | 45 | 60 |
| 15-minute larval count | | | | | Average | 108 |
| | | | | | High | 279 |

| Item | Subplots | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
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Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot 4 Township: Saratoga County, New York Acres:

Date Sprayed: Check Dose: Check

Spray Concentrate (Actual) 0 Spray Concentrate (Specif.) 0

| Item | Subplots 1 | 2 | 3 | 4 | 5 | Average |
|---|---|---|---|---|---|---|
| Deposit, Petri dishes | 0 | 0 | 0 | 0 | 0 | |
| Egg mass/acre - spring | 1710 | 2340 | 3680 | 2120 | 3300 | 2630 |
| Egg mass/acre - preliminary | 560 | 1120 | 240 | 200 | 200 | 464 |
| Egg mass/acre - fall | 810 | 1080 | 40 | 240 | 80 | 446 |
| Egg/mass - spring | | | | | | |
| Egg/mass - fall | Large | medium | small | small | small | |
| Trees/trees/day/hammock | 0.99 | 3.36 | 1.80 | 1.27 | 0.45 | 1.62 |
| Reduction - Egg mass/acre | | | | | | |
| Defoliation, pre-spray % | 15 | 20 | 60 | 50 | 55 | 40 |
| Subs. only defoliation, post-spray % | 50 | 80 | 95 | 90 | 95 | 82 |
| 3-minute larval count | | | | | Average | 118 |
| | | | | | High | 352 |

Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot 5 Township: Saratoga County, N.Y. Acres: 200

Date Sprayed: May 25, 1965 Dose: 1 pt. 90TS

Spray Concentrate (Actual) $1.41 \times 10^9$ cry/ml Spray Concentrate(Specif.) $1.79 \times 10^9$ sp/ml
$1.75 \times 10^9$ sp/ml

sp/cryo = 1.24:1

| Item | SUBPLOTS 1 | 2 | 3 | 4 | 5 | Average |
|---|---|---|---|---|---|---|
| Count, Petri dishes | 285.5 | 292.5 | 173 | 246 | 57 | 210.8 |
| Egg mass/acre - spring | 3250 | 2120 | 2950 | 1150 | 2100 | 2314 |
| Egg mass/acre - preliminary | 440 | 320 | 340 | 280 | 200 | 296 |
| Egg mass/acre - fall | 200 | 680 | 400 | 200 | 525 | 401 |
| Cat/mass - spring | | | | | | |
| Egg/mass - fall | medium | large | large | large | large | |
| Mod frass/day/hummock | 0.44 | 0.37 | 0.35 | 0.81 | 1.27 | 0.64 |
| Reduction - Egg mass/acre | | | | | | |
| Defoliation, pre-spray % | 7 | 7 | 5 | 15 | 15 | 9.8 |
| Mod. only Defoliation, post-spray % | 50 | 25 | 20 | 45 | 35 | 34.8 |
| 15-minute larval count | | | | | Average<br>High | 48<br>99 |

Plot Data Form - WTS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot 6 Township: Saratoga County, N.Y. Acres

Date Sprayed: Check Dose: Check
Spray Concentrate(Actual) - Spray Concentrate (Specif.) -

| Item | SUBPLOTS 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Deposit, Petriadishes | 0 | 0 | 0 | 0 | 0 | |
| Egg mass/acre - spring | 9360 | 3920 | 4720 | 9200 | 3000 | 6440 |
| Egg mass/acre - preliminary | 680 | 280 | 640 | 880 | 400 | 376 |
| Egg mass/acre - fall | 800 | 240 | 400 | 440 | 200 | 418 |
| Eggs/mass - spring | | | | | | |
| Eggs/mass - fall | small | medium | small | small | medium | |
| Grams frass/day/hammock | 2.61 | 2.03 | 3.16 | 2.82 | 2.72 | 2.65 |
| % reduction - Egg mass/acre | | | | | | |
| Defoliation, pre-spray % | 10 | 10 | 15 | 15 | 18 | 16.8 |
| Spec. only Defoliation, post-spray % | 70 | 90 | 80 | 70 | 90 | 80 |
| 10-minute larval count | | | | | Average<br>High | 154<br>416 |

Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot E-1 Township Conn. Acres 211

Date Sprayed: May 23, 1965 Dose 2 pints/2 gallons

Spray Concentrate (Actual) $1.11 \times 10^9$ cry/ml $2.00 \times 10^9$ sp/ml Spray Concentrate (Specif.)

Sp/crys = 1:0.78

| Item | SIMPLOTS | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Deposit, Petri dishes | 490 | 327 | 514 | 279 | 85 | 299 |
| Egg mass/acre - spring | 6280 | 16,750 | 3340 | 2320 | 9630 | 7664 |
| Egg mass/acre - preliminary | 180 | 2000 | 2200 | 1800 | 1000 | 1436 |
| Egg mass/acre - fall | 320 | 720 | 880 | 1190 | 280 | 678 |
| Eggs/mass - spring | 400 | 400 | 350 | 350 | 300 | 360 |
| Eggs/mass - fall | 300 | 300 | 330 | 350 | 300 | 320 |
| Grams/frass/day/hammock | 6.2 | 12.4 | 6.2 | 5.0 | 6.9 | 7.34 |
| % reduction - Egg mass/acre | | | | | | |
| Defoliation, pre- % spray | 15 | 12 | 5 | 5 | 15 | 10.4 |
| Defoliation, % Post-spray | 100 | 92.5 | 87.5 | 97.5 | 100 | 97 |
| 10-minute larval count | | | | | Average | 396.6 |
| | | | | | High | 498 |

Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot E-2 Township Conn. Acres 318

Date Sprayed May 24, 1965 Dose 1 pint/2 gallons

Spray Concentrate (Actual $1.16 \times 10^9$ crys/ml $1.50 \times 10^9$/ml Spray Concentrate (Specif.)

Sp/cryst: ratio = 1.66:1

| Item | SUBPLOTS 1 | 2 | 3 | 4 | 5 | Average |
|---|---|---|---|---|---|---|
| Deposit, Petri dishes | | not obtained | | | | |
| Egg mass/acre - spring | 110 | 250 | 160 | 370 | 210 | 220 |
| Egg mass/acre - preliminary | 0 | 40 | 0 | 0 | 0 | 8 |
| Egg mass/acre - fall | 0 | 190 | 0 | 170 | 0 | 92 |
| Eggs/mass - spring | 600 | 390 | 450 | 390 | 400 | 450 |
| Eggs/mass - fall | 400 | 300 | 550 | 350 | 400 | 560 |
| Man frass/day/hammock | 0.6 | 1.9 | 1.4 | 2.5 | 1.3 | 1.58 |
| % reduction - Egg mass/acre | | | | | | |
| Defoliation, pre- spray % | 10 | 8 | 9 | 5 | 2 | 6 |
| Defoliation, post-spray % | 50 | 50 | 50 | 45 | 45 | 46 |
| 3-minute larval count | | | | | Average | 84 |
| | | | | | High | 116 |

Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot E-3 Township Connecticut Acres 204

Date Sprayed May 20, 1965 Dose 1 pint/2 gallons

Spray Concentrate (Actual) $4.93 \times 10^8$ crys/ml $7.75 \times 10^8$ sp/ml Spray Concentrate (Specif.)

sp/cryst ratio = 1:0.5

| Item | SUBPLOTS 1 | 2 | 3 | 4 | 5 | Average |
|---|---|---|---|---|---|---|
| Count, Petri dishes | 25.5 | 124 | 270.5 | 120.5 | 59.5 | 120.0 |
| Egg mass/acre - spring | 9610 | 8510 | 10590 | 1960 | 990 | 6212 |
| Egg mass/acre - preliminary | 3000 | 6000 | 3000 | 240 | 50 | 2458 |
| Egg mass/Acre - fall | 4000 | 10,000 | 3965 | 150 | 40 | 1830 |
| Eggs/mass - spring | 250 | 250 | 300 | 300 | 350 | 250 |
| Eggs/mass - fall | 250 | 250 | 250 | 250 | 250 | 250 |
| Mean Tenax/day/hammock | 6.3 | 6.9 | 6.1 | 5.0 | 2.4 | 5.34 |
| % reduction - Egg mass/acre | | | | | | |
| Defoliation, pre spray % | 5 | 15 | 5 | 1 | 1 | 4.4 |
| Defoliation, post-spray % | 99 | 97.5 | 90 | 90 | 70 | 90 |
| 1 minute larval count | | | | | Average<br>High | 210<br>332 |

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Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot E-4 Township Connecticut Acres 342

Date Sprayed May 21 and May 23, 1965 Dose 1 pint/2 gallons

Spray Concentrate (Actual) $8.29 \times 10^8$ cryst/ml $1.73 \times 10^9$ sp/ml Spray Concentrate (Specif.)

sp/cryst ratio= 1:0.49

| Item | SUBPLOTS | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Deposit, Petri dishes | 310 | 82 | 308 | 405 | 805 | 164.8 |
| Egg mass/acre - spring | 4850 | 4900 | 5410 | 4660 | 5750 | 4710 |
| Egg mass/acre - preliminary | 1500 | 1500 | 240 | 560 | 730 | 870 |
| Egg mass/acre - fall | 1500 | 2210 | 490 | 1500 | 2160 | 1560 |
| Eggs/mass - spring | 350 | 300 | 300 | 300 | 275 | 305 |
| Eggs/mass - fall | 350 | 350 | 300 | 300 | 250 | 310 |
| Gypsy frass/day/hammock | 4.0 | 4.2 | 3.7 | 4.8 | 3.4 | 4.02 |
| % reduction - Egg mass/acre | | | | | | |
| Defoliation, pre-spray % | 4 | 8 | 10 | 5 | 5 | 5.8 |
| Defoliation, post-spray % | 28 | 50 | 45 | 75 | 70 | 65 |
| 11-minute larval count | | | | | Average | 85.3 |
| | | | | | High | 117 |

Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot E-5 Township: Connecticut Acres

Date - Dose Check

Spray Concentrate (Actual) Spray Concentrate (Specif.) -

| Item | SUBPLOTS | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| posit, Petri dishes | 25 | 88.5 | 10.5 | 22 | 78.5 | 55.9 |
| g mass/acre - spring | 690 | 470 | 220 | 290 | 1170 | 568 |
| g mass/acre - preliminary | 400 | 100 | 240 | 1000 | 4000 | 1148 |
| g mass/acre - fall | 470 | 290 | 220 | 730 | 4280 | 1198 |
| mass - spring | 350 | 350 | 350 | 300 | 400 | 350 |
| gs/mass - fall | 300 | 300 | 350 | 300 | 300 | 310 |
| ms frass/day/hammock | 6.1 | 3.8 | 3.1 | 6.1 | 3.4 | 4.90 |
| reduction - g mass/acre | | | | | | |
| foliation, pre-spray % | 2 | 5 | 3 | 2 | 5 | 4 |
| foliation, post-spray % | 70 | 75 | 82.3 | 725 | 95 | 78 |
| -minute larval count | | | | | Average<br>High | 111.3<br>204 |

Plot Data From - 9000 1963 Test - Spray Mesh - E.T. and Cam.

Plot E-4 Township Connecticut Acres 210

Date Sprayed: May 24, 1962 Area 3 plots/2 gallons

Spray Concentrate (Actual) $2.73 \times 10^9$ spr/ml Spray Concentrate (Specif.)

$2.01 \times 10^9$ spr/ml

Spr/spray Ratio 1:0.73

| Item | Subplots | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Coll. Feral diptera | 896 | 140 | 320 | 684.3 | 272 | 322.3 |
| Mosq./acre - spring | 2020 | 130 | 318 | 1818 | 1740 | 1202 |
| Mosq./acre - preliminary | 1320 | 0 | 315 | 1320 | 1200 | 1235 |
| Mosq./acre - fall | 2710 | 100 | 320 | 4320 | 1740 | 2250 |
| Mosq. - spring | 475 | 420 | 400 | 420 | 420 | 411 |
| Mosq. - fall | 375 | 320 | 320 | 420 | 475 | 390 |
| Trail/day/mosq. | 9.7 | 2.3 | 3.4 | 5.6 | 7.7 | 5.34 |
| Reduction Egg mass/acre | | | | | | |
| Foliation, pre-spray % | 12 | 12 | 8 | 10 | 2 | 10 |
| Foliation, post-spray % | 85 | 37.3 | 67.3 | 82 | 90 | 72 |
| Minute Interval count | | | | | Average | 120 |

Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot E-7 Township Connecticut Acres 258

Date Sprayed May 25, 1965 Dose 2 pints/2 gallons

Spray Concentrate (Actual) $1.75 \times 10^{9}$ sp/ml Spray Concentrate (Specif.) $5.30 \times 10^{8}$ crys/ml

Sp/crys Ratio 1: 0.30

| Item | SUBPLOTS 1 | 2 | 3 | 4 | 5 | Average |
|---|---|---|---|---|---|---|
| Deposit, Petri dishes | 153.5 | 437.5 | 417.5 | 255 | 390 | 330.7 |
| Egg mass/acre - spring | 1440 | 260 | 890 | 360 | 370 | 804 |
| Egg mass/acre - preliminary | 1500 | 300 | 400 | 20 | 120 | 448 |
| Egg mass/acre - fall | 2460 | 200 | 860 | 10 | 200 | 746 |
| Egg/case - spring | 325 | 300 | 400 | 300 | 10 | 355 |
| Egg/case - fall | 225 | 250 | 430 | 300 | 300 | 305 |
| Cases trees/dip/hemlock | 4.3 | 4.5 | 3.7 | 2.8 | 5.4 | 3.98 |
| Production - Egg mass/acre | | | | | | |
| Defoliation, pre-spray % | 9 | 2 | 3 | 10 | 6 | 5.2 |
| Defoliation, post-spray % | 65 | 70 | 47.5 | 45 | 45 | 67 |
| 10-minute larval count | | | | | Average 171 High 266 | |

Plot Data Form - 90TS 1965 Test - Gypsy Moth - N.Y. and Conn.

Plot#-S  Township Conn.  Acres

Date Sprayed  Dose Check

Spray Concentrate (Actual)  Spray Concentrate (Specif.)

| Item | SUBPLOTS | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| posit, Petri dishes | 0 | 0 | 0 | 0 | 0 | 0 |
| mass/acre - spring | 7200 | 6700 | 7410 | 5130 | 2050 | Abou |
| mass/acre - preliminary | 2500 | 1500 | 940 | 840 | 600 | 1396 |
| mass/acre - fall | 3210 | 1800 | 850 | 600 | 1000 | 1492 |
| ness - spring | 350 | 400 | 350 | 400 | 400 | 380 |
| s/mass - fall | 550 | 400 | 283 | 350 | 130 | 340 |
| mass frass/day/hammock | 6.0 | 7.0 | 4.3 | 4.4 | 6.4 | 5.72 |
| reduction - Egg mass/acre | | | | | | |
| foliation, pre-spray % | 5 | 2 | 8 | 10 | 2 | 5.4 |
| foliation, post-spray % | 95 | 97 | 95 | 65 | 75 | 85.4 |
| Moderate Larval count | | | | | Average<br>High | 478.1<br>788.2 |

Fig. 1. Helispot - Connecticut

Fig. 2. Mixing and loading setup - Connecticut, 1965

Fig. 3. Bell 47 showing boom arrangement

Fig. 4. Drop tray as used in 1965

Fig. 5. Aerial photo of check plot 1965 tests

Fig. 6. Aerial photo showing general terrain and defoliation in Connecticut

Dubois

4500-FS-NE-2202.18

To all cooperators and interested parties:

Enclosed is the preliminary report on the 1965 Bt test against the gypsy moth in New York.

The data presented in Table 2, especially in regard to residual egg masses per acre and percent egg mass reduction will be revised when the final egg mass counts are made. These counts will, undoubtedly, require a revision in the preliminary conclusions stated in this report.

It is anticipated that the final data reduction and report will be completed and distributed by January 1, 1966.

# PRELIMINARY REPORT

## 1965 Bt TEST AGAINST THE GYPSY MOTH IN NEW YORK

In May 1965 a cooperative pilot test of a new Bt formulation against the gypsy moth was conducted by personnel of the New York State Conservation Department, New York Museum and Science Service, and the Northeastern Forest Experiment Station. This report is a brief summary of the preliminary results. A final report will be issued later this year.

Areas treated.--Four treated and two check plots were established in the vicinity of Charleton-Ballston Lake, New York. All plots were principally composed of birch-poplar stands and had initial insect population counts of 2,000 - 6,500 egg masses per acre.

Treatments.--Thuricide 90TS Flowable®, extended activity microbial insecticide, was the active material used in this test. Two dosages, 1 pint/A and 1 quart/A, of the active material were tested on two plots each. The active material was diluted with water. No stickers or additives were used. Rate of application was 2 gallons of finished spray per acre. Table 1 gives the essentials of the treatments used.

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® manufactured by Biofern Division of International Minerals and Chemical Company.

Table 1.--Plot size and treatments -- Bt test
New York - 1965

| Plot | Acres | Dose (Bt) | Gallons | | |
|---|---|---|---|---|---|
| | | | Bt | HOW | Finished spray* |
| 1 | 115 | 1 quart | 31.55 | 221.45 | 253 |
| 2 | 90 | 1 quart | 24.75 | 173.25 | 198 |
| 3 | 230 | 1 pint | 31.62 | 474.38 | 506 |
| 5 | 200 | 1 pint | 27.50 | 410.00 | 437.5 |
| TOTAL | 635 | | 115.42 | 1279.08 | 1394.5 |

All treatments were applied by Bell 47G4 helicopter on May 25, 1965. Applications were made under clear, calm conditions and were assessed as satisfactory.

Airport operations.--No technical difficulties were encountered in mixing the Bt concentrate at the airport. Mixing was done in a new 275 gallon tank using a circulating pump. All treatments were mixed 3 - 5 minutes before loading the helicopter. Loading time was 1 - 3 minutes.

Two helispots were used involving one move of the loading and mixing equipment.

Five loads were required for plot 1, 4 loads for plot 2, 10 loads for plot 3, and 7 loads for plot 5. Elapsed flight time was 2 hours and 34 minutes.

*Includes 10 percent overage.

Table 1.--Fish size and treatments -- Pt. test
New York - 1965

| Plot | Acres | Done (Pt.) | Pt. | Gallons NOW | Finished spray* |
|---|---|---|---|---|---|
| 1 | 115 | 1 quart | 31.55 | 221.85 | 215 |
| 2 | 90 | 1 quart | 24.75 | 173.25 | 171 |
| 4 | 180 | 1 pint | 31.62 | 474.30 | 510 |
| 3 | 300 | 1 pint | 27.50 | 410.00 | 487.5 |
| TOTAL | 685 | | 115.42 | 1279.00 | 1383.5 |

All treatments were applied by Bell 47J4 helicopter on May 25, 1965. Applications were made under clear, calm conditions and were assessed as satisfactory.

Airport operations --No technical difficulties were encountered in mixing the Pt concentrate at the airport. Mixing was done in a new 275 gallon tank using a circulating pump. All treatments were mixed 3 - 5 minutes before loading the helicopter. Loading time was 1 - 2 minutes.

Two helicopters were used involving one hour of time for ferrying and refueling.

Five loads were required for plot 1, 6 loads for plot 2, 10 loads for plot 4, and 9 loads for plot 3. Elapsed flight time was 2 hours and 30 minutes.

*Includes 5% percent overage.

Treatment evaluations.--As in past Bt tests, 5 0.1 acre sampling subplots were established in all 6 plots. All evaluations were made in the 0.1 acre sampling points or along the string line which connected them.

The evaluation techniques used were:

1. Spray coverage as measured by colony formation on 2 - 10 cm. Petri dishes placed in each subplot.
2. Frass weight collected in 3 cheesecloth trays established in each sampling subplot.
3. Larvae mortality causes determined microscopically on dead larvae recovered from the drop trays.
4. Ten minute live larval counts made while slowly walking along the string line.
5. Defoliation readings made periodically in each sampling subplot prior to spray and after spray to conclusion of feeding.
6. Insect population counts expressed as egg masses per acre were made in each subplot before spray and again immediately after egg deposition was completed by the treated population. Final egg mass counts will be made in November.

As in past Bt tests, the primary criteria of effect of the treatment are egg mass per acre reduction and number of residual egg masses per acre. As in past tests, acceptable control will be achieved if the residual egg masses per acre are 50 or less.

Treatment evaluation in pure Bt cases, n 0.1 acre sampling subplots were established in all 4 plots. All evaluations were made in the 0.1 acre sampling points or along the strips which connected them.

The evaluation techniques used were:

1. Spray coverage as measured by colony formations on 2 - 10 cm. Petri dishes placed in each subplot.
2. Larvae weighs collected in 3 cheesecloth traps established in each sampling subplot.
3. Larvae most fully - worn determined microscopically on dead larvae recovered from the trap traps.
4. Pan mimics like larval counts made while slowly walking along the swing line.
5. Defoliation readings made periodically in each sampling subplot prior to spray and after spray to completion of feeding.
6. Insect population counts expressed as egg masses per tree were made in each subplot before spray and again immediately after egg deposition was completed in the treated population. Final egg mass counts will be made in November.

As in past tests, the primary criteria of effect of the treatment are egg mass per acre reduction and number of residual egg masses per acre. As in past tests, acceptable control will be achieved if the residual egg masses per acre are 50 or less.

The other evaluation procedures cited above are supplementary or supporting data for the primary criteria of effect.

Preliminary results.--Preliminary results based on residual numbers of egg masses per acre and percent egg mass reduction indicate the following:

1. The gypsy moth population in the entire experimental area was reduced by the action of natural control factors.
2. The 1 quart Bt dose reduced the population to a level very near to acceptable control.
3. The 1 pint Bt dose reduced the population slightly more than that observed in the check plots and did not reach an acceptable level of control.
4. A significant amount of the reduction in all plots, treated and untreated, was due to the effects of natural polyhedrosis.

Table 2 presents the summarized data available at the present time.

Preliminary results.--Preliminary results based on total numbers of egg masses per acre and percent egg mass reduction indicate the following:

1. The spray materials applied in the entire experimental area reduced by the action of natural control factors.

2. The 1 quart DDT plus reduced the population to a level very near to acceptable control.

3. The 1 pint DDT dose reduced the population slightly more than that observed in the check plots and did not reach an acceptable level of control.

4. A significant amount of the reduction in all plots, treated and untreated, was due to the effects of natural pathogens.

Table 5 presents the summarized data available at this writing.

Table 2.--Preliminary data summary - N. Y. [illegible] test - 1965

| Plot | Dose applied[1] | Pre | Prelim. | Percent reduction | Deposit (plates) | 10-minute count | Grass weight | Mortality[2] Bt | Mortality[2] Virus | Percent[3] defoliation |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Lyr counts/A | | | | | | | | |
| 1 | $4.25 \times 10^9$ | 3710 | 80 | 97 | 789.2 | 45 | 0.26 gm. | 26 | 39 | 12 |
| 2 | $5.25 \times 10^9$ | 2606 | 180 | 92.5 | 732.8 | 43 | 0.24 gm. | 20 | 50 | 25 |
| 3 | $3.75 \times 10^9$ | 3154 | 384 | 87 | 746.4 | 108 | 1.66 gm. | 32 | 26 | 47 |
| 4 | 0 | 2630 | 464 | 82 | 0 | 118 | 1.62 gm. | 0 | 62 | 42 |
| 5 | $1.79 \times 10^9$ | 2314 | 296 | 86.5 | 210.8 | 48 | 0.64 gm. | 38 | 39 | 25 |
| 6 | 0 | 6440 | 576 | 91 | 0 | 154 | 2.65 gm. | 0 | 68 | 53 |

1/ Viable spores per ml. (drop plate method)

2/ Expressed as percentage of all dead larvae recovered

3/ Net defoliation change on susceptible species only

| | | |

It can be seen from Table 2 that the high dosage effected the greatest percent egg mass reduction and the lowest number of egg masses per acre (95 percent and 130 respectively); also that the lower dosage (86.5 percent and 340 respectively) and the check plots (86.5 percent and 430 respectively) were essentially similar and that the lower dosage did not achieve acceptable control levels.

Preliminary conclusions.--On the basis of the data presently accumulated, the following tentative conclusions can be reached pending the final egg mass counts.

1. The higher dosage applied (1 quart in 2 gallons of water per acre) appears to have reduced the population over and above that which occurred naturally and that near practical control seems to have been achieved.
2. The lower dosage applied (1 pint in 2 gallons of water per acre) did not appreciably affect the population trend in the area.
3. The occurrence of natural virus disease in all experimental plots appreciably contributed to the general decline of the insect population.

These tentative conclusions will, undoubtedly be revised when the final egg mass counts are made late this fall.

F. B. Lewis, NEFES
D. P. Connola, N.Y. Museum and Sci. Serv.
J. J. Homiak, N.Y. Conservation Dept.

It can be seen from Table 2 that the high dosage effected the greatest percent egg mass reduction and the lowest number of egg masses per acre (93 percent and 130 respectively); also that the lower dosage (86.5 percent and 430 respectively) and the check plots (86.5 percent and 430 respectively) were essentially similar and that the lower dosage did not achieve acceptable control levels.

Preliminary conclusions.--On the basis of the data presently accumulated, the following tentative conclusions can be reached pending the final egg mass counts.

1. The higher dosage applied (1 quart in 2 gallons of water per acre) appears to have reduced the population over and above that which occurred naturally and that near practical control seems to have been achieved.

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